stations. At Allahabad the northerly component *diminishes* during the dry season until midday, after which it increases until about 5 p.m., the epochs advancing two hours from November to April. At Lucknow the northerly component *increases* rapidly to a maximum at 11 a.m., and diminishes again to a minimum at 3 p.m., after which the changes are slow and irregular.

In the wet season there is an average increase in the northerly component at Allahabad from midnight until 4 p.m., and a corresponding decrease for the rest of the day. At Lucknow the main feature is a sudden increase in the northerly component between 10 a.m. and 11 a.m., after which there is a decrease with oscillations to the minimum at 10 a.m. on the following day, the rapid afternoon fall being absent.

These features of the transverse oscillation, together with the greater steadiness of the winds at Lucknow, appear to be partly due to its more central situation; but the backing of the wind during the day indicates that a longer period is necessary to produce the larger motion in the direction of the trough than is requisite for the smaller transverse variation. It is probable that for Allahabad the earlier transverse motion is modified by the effect of the Central Plateau; this effect diminishes in the afternoon, and is replaced by the influence of the Himalayas, which is, of course, weaker than at Lucknow. The nature of the transverse variation appears also to imply that the effect of the Himalaya range in constraining the air motion in the plain is actually produced dynamically through the medium of rotary motion transverse to itself rather than through a forcing of the stream lines to conform to parallelism with a rigid boundary.

The solution of the problems presented, and their connection with convective motion not shown directly by the winds, would be considerably advanced by a knowledge of the vertical temperature gradient in the free atmosphere over the plain.

A noteworthy feature is brought out in the auxiliary tables, representing the steadiness of the wind by the ratio of the resultant air movement to the total movement. The winds of the wet season are most steady near midnight, while in the dry season the epoch of maximum steadiness is about 4 p.m.

The accompanying tables exhibit the main features of the annual variation and the distribution of the wind.

Season	Month	Lucknow: Percentage amount of wind to total amount in each month from N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Monthly percentage of wind	Allahabad: Percentage amount of wind to total amount in each month from N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Monthly percentage of wind
Dry	October	26·0	9·2	6·5	1·9	1·2	6·2	18·1	30·9	5·3	13·9	14·7	13·0	6·5	3·5	7·8	21·6	19·0	5·7
	Nov. ..	30·3	8·2	1·9	1·7	0·9	5·5	21·3	30·2	3·9	15·2	11·0	10·6	6·4	2·7	5·1	25·7	23·4	4·3
	Dec. ...	22 5	7·7	3·3	2·1	1·8	13·2	27·6	21·8	4·8	10·4	8 9	7·5	4·2	3·4	7·4	34·0	24·2	5 6
	January	19·0	7·3	6 9	3·6	2·8	10·6	25·5	24·3	6·3	8·8	11·8	15 0	3·9	2·2	8·2	32·2	17·9	6 9
	February	22·4	7·3	4·1	2 6	1·9	8·4	25·7	27·6	8·4	7·2	10·4	11·8	6·4	2·8	8·0	33·0	20·4	7·2
	March...	16·3	5·9	3·3	4·1	3·5	11·6	30·8	24·5	11·6	10·4	13·6	6·7	3·3	2·3	6·4	34·6	22·8	9·4
	April ...	16·8	9·1	4·2	2·0	3·9	10·8	26·0	27·2	12·1	12·7	14·4	6·9	4·6	5·3	7·9	28·0	20·2	9·1
	May ...	12·6	10·2	15·7	6·0	4·1	9·0	22·2	20·2	11·1	15·0	16·2	16·5	8·2	5·0	4·6	16·4	18·2	10·8
Wet	June ...	13·9	14·0	20·3	7·2	5·5	9·4	14·6	15·1	11·2	9·1	18·2	21·5	9·1	7·1	9·3	14·6	11·1	11 8
	July ...	16·5	14·4	22·0	9·7	7·3	11·2	9·7	9·2	9·9	7·6	12·8	16·5	7·5	11·7	14·2	18·5	11·2	10·8
	August	18·3	13·0	19·5	7·8	7·5	11·1	10·6	12 2	7·5	8·4	16·3	18·3	7·8	5·8	12·0	20·7	10·7	10·1
	Sept. ...	17·4	15·8	16 6	6·3	3·0	7·3	15·6	18·0	7·9	10·9	17·5	17·5	8·9	4·6	11·4	18·7	10·5	8·3
	Year ...	18·0	10·4	11·2	4·9	4·0	9·8	20·7	21·0	100	10·6	14·3	14·2	6·6	5·2	8·8	23·8	16·5	100

We note that the winds were taken from the records of Beckley's anemograph, but there appears to be no statement regarding the factor used in the reduction to miles per hour. In any case, the winds are comparatively feeble, the maximum recorded in any single hour being thirty-five miles at Lucknow and forty-five miles at Allahabad. There appears to be an inconsistency between the statement on p. 320 of the years of maximum and minimum movement and the table on the preceding page, so that either the suggestion of periodicity or the table needs readjustment.

The arrangement of the memoir is excellent, and it is full of suggestiveness to the student of meteorology. It forms a valuable contribution to our knowledge of Indian meteorology. E. G.

MEDICAL INSPECTION IN LONDON.[1]

DR. JAMES KERR, medical officer (education) to the London County Council, here adds another to the series of his admirable reports. These always contain much that cannot be neglected by the students of educational conditions, and this report is no exception. It consists of sixty-six pages crowded with new materials of the highest scientific and practical value. Administratively, probably the most important statement in the report is that "a point has now been reached, as to whether the greater part of the medical inspection shall remain fruitless, or whether the Council shall take steps which will justify its later interference to see that its younger dependents have a fair chance of benefiting properly by the education offered. Treatment as a public concern will have to be considered in respect to certain educational matters, such as visual troubles, discharging ears, ringworm, and the care of the teeth, in which neither the private practitioner nor the hospitals can give hope of either providing sufficient or satisfactory relief for most of the cases requiring it" (p. 3). A composite committee has been appointed to inquire into this serious problem, on which the circular recently issued by the Board of Education has a definite bearing. The report of this committee will be looked for with interest alike by the hospitals and the practitioners.

The general results of the medical inspection confirm the work of previous years. The medical officers are now coming to closer quarters with the children, and this report contains many careful pieces of special research. These it is here possible only to indicate. Emphasis is laid on the urgency of the inspection of infants, especially of infants of three to five years of age. Tubercular bone and joint disease can then be most readily prevented. In inspection of the secondary schools and training colleges there was noticed a "general ignorance of how to expand the thorax by deep inspiration" (p. 8). Among girls, "headaches were complained of by 20·5 per cent. . . . Exaggerated movements, corrugated foreheads, insomnia, and somnambulism were met with. Several cases of overstrain were specially reported" (p. 9). "The average standard of physique is low." There is a careful mathe-

[1] London County Council. Report of the Education Committee of the London County Council submitting the Report of the Medical Officer (Education) for the year ended March 31, 1907.

matical study (pp. 10–16) by Dr. Shrubsall of the statistics of growth. The general results might with advantage have been further elaborated on the practical side. As to teeth, there is a strong plea for school dental clinics on the model of Strassburg.

A special investigation as to tuberculosis of the lungs in school children was undertaken by Dr. Squire and Dr. Annie Gowdey. Of actual phthisis, only 335 cases (*i.e.* 0·55 per cent.) were found among 58,934 children. The sections on hearing and acuity of vision contain much fresh material. One of the most important sections deals with the "development of articulatory capacity for consonantal sounds" (p. 27). Considerable detail is given of the methods of testing, and 105,000 tests were made on some 3000 children. The results are given in an exact quantitative way, capable of analytical study. This department is of immense importance to the teacher, as the work already done in phonetics has abundantly shown. As to fatigue, some new curves from rifle-shooting are given. It is found that the curve improves with a little practice, co-ordination improving very rapidly. Cigarette-smoking was found to impair the capacity to shoot straight.

There are the usual sections dealing with the inspection of defective children and cripples, country homes, infectious diseases, adenoids, &c.; but two sections must be specially named, one on the artificial lighting of school-rooms and the other on the mental and physical effects of bad ventilation. In both researches the practical results are very definite, and ought to be driven home among teachers and architects alike. Of the ventilation research, some provisional conclusions are:—"Temperatures above 65° F. give rise to definite subjective symptoms, slackness and inattention in some, headaches in others. Although it is not easy to assert definite mental alteration till about 70° F." "Symptoms do not appear at 65° if the air is kept in gentle movement by a fan in the room. With temperatures 70° F. and above, other factors being normal, there are marked symptoms and very evident deterioration in mental alertness and accuracy." At low temperatures, relative humidity does not affect the mental capacity of children, but increase of humidity increases the effects of high temperatures. Carbonic acid gas in considerable excess increases markedly the fatigue of the children. Exact details are given of the methods used.

The London County Council is to be congratulated on the issue of this mass of original and important observations in so many departments of medical inspection. Dr. Kerr's reports show the great educational possibilities of the system, which, under his guidance, has revealed many new regions for clinical and scientific research.

THEORY OF THE MIRAGE.

THE theory of the mirage forms the subject of several recent papers by Prof. Antonio Garbasso. In notes contributed to the *Atti dei Lincei*, xvi. (2), 1, 8, the author discusses the propagation of light in a heterogeneous medium, making use of the principle of least time, and considering the case of space of any number of dimensions defined by curvilinear coordinates. The space in question is supposed to be subject to the usual assumption that the square of the line-element is a homogeneous quadratic function of the differentials of the coordinates. As might be expected from the principle of least action (an analogy the applications of which to the problem are probably already known), the equations of the path can be reduced to the form of the ordinary equations of dynamics by a suitable choice of the characteristic function. The applications to the mirage itself are discussed in a paper in the *Memorie* of the Turin Academy, 1907. Prof. Garbasso claims that while the phenomenon has been studied both experimentally and theoretically, his present work fills a gap in the literature by establishing agreement of a quantitative character between the results of calculation and those of experiment.

Two kinds of mirage are distinguished, one due to the variations of density caused by diffusion between two fluids of different refrangibility initially having a plane of separation; this is called the mirage of Vince. The second kind, called the mirage of Monge, depends on diffusion outwards from a plane boundary maintained indefinitely at the same conditions. The former condition gives three images, two direct and one inverted; the latter gives only the reflected image. Prof. Garbasso calculates the law of density from the equations of diffusion, and thus determines the equations of the trajectories of the rays of light and the form of the wave-front.

The final comparison with experiment is discussed in a paper by Luigi Rolla, also in the *Memorie* of the Turin Academy. In it the last-named author describes experiments showing how, not only has Wollaston's original artificial mirage of the Vince type been reproduced with its three images, but also the Monge mirage has been imitated, and in both cases the trajectories of the rays have been determined by observation and compared with results of theory. Moreover, a mirage with five images, observed by Parnell at Folkestone in 1869, was realised by placing over a layer of carbon bisulphide a mixture of equal parts by volume of alcohol and chloroform. Owing to the unequal rates of diffusion, the conditions give rise to five images, and this and other experiments are shown to be suitable for lecture-room demonstration.

By taking a block of gelatin containing a cavity filled with liquid which gradually diffuses into the gelatin, the corresponding images for a cylindrical or spherical distribution of density have been also produced and compared with the results of mathematical calculation.

The first and second figures show the mirages of a diaphragm somewhat in the shape of a ship produced by the medium formed by diffusion between alcohol and

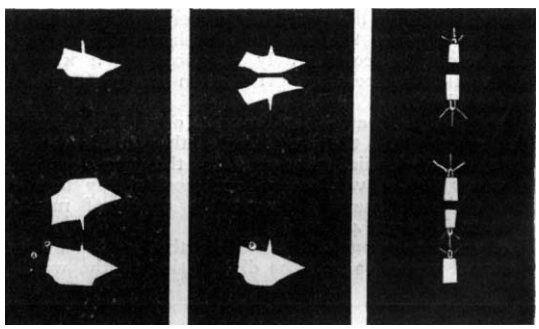

FIG. 1. FIG. 2. FIG. 3.

bisulphide of carbon. Fig. 1 represents the appearance after a few hours, Fig. 2 after several days. Fig. 3 shows the five images obtained by diffusion between bisulphide of carbon and a mixture of alcohol and chloroform.

G. H. B.

A CONTRIBUTION TO THE HISTORY OF IRONCLADS.

LORD ROSSE has made an interesting contribution to the history of ironclads by placing at the service of the Institution of Naval Architects copies of letters written by his father to various distinguished men in the years 1854–5. From these letters it appears that the late Lord Rosse not merely appreciated the importance of armour protection against horizontal shell fire, but satisfied himself that it was possible by means of suitable proportions to secure ample stability in ironclad ships. Naval officers were then disposed to think that the "top-weight" inevitable with heavy loads of armour would make vessels unstable. Lord Rosse proposed the construction of ironclad floating batteries of moderate size; they were intended to fight in smooth water, and consequently were to carry their guns at a small height above water. The exposed sides were to be armoured with 5 inches of iron, and the upper decks to be covered with 2-inch plating.

In a letter to Sir John Burgoyne dated June 26, 1854, Lord Rosse proposed an armament of sixteen heavy guns; the draught of water was not to exceed 12 feet to 13 feet, and the vessel was estimated to be about 1500 tons. He